Flashcards

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Total Cards: 10

Card 1/10

Q: What are the core functions of the Network Layer, and how do they differ from the Data Link Layer?

A: The Network Layer handles end-to-end packet delivery across multiple network hops, manages logical addressing (IP addresses), and understands the network topology. The Data Link Layer, on the other hand, focuses on frame delivery between directly connected nodes on a single physical link (MAC addresses).

Card 2/10

Q: Compare and contrast connectionless and connection-oriented network services at the Network Layer.

A: Connectionless (datagram) services handle each packet independently, offering flexibility but no guaranteed delivery order or QoS. Connection-oriented (virtual circuit) services establish a dedicated path before data transfer, ensuring ordered delivery and consistent performance, but with initial setup overhead and less adaptability. MPLS is a key example of a virtual circuit technology.

Card 3/10

Q: How does Dijkstra's algorithm determine the shortest path in a network?

A: Dijkstra's algorithm finds the shortest path by assigning tentative distances (initially infinity) to all nodes except the source (distance 0). It iteratively selects the unvisited node with the smallest tentative distance, marks it as permanent, and updates the tentative distances of its neighbors. This continues until all reachable nodes are visited.

Card 4/10

Q: Explain the 'count-to-infinity' problem and how link state routing mitigates it.

A: In distance vector routing, slow convergence can cause the 'count-to-infinity' problem where routers continuously increment hop counts when a link fails. Link state routing avoids this by distributing the entire network topology to each router, enabling independent shortest path calculation via Dijkstra's algorithm, leading to faster convergence.

Card 5/10

Q: Why is hierarchical routing crucial for large network scalability? Provide an example.

A: Hierarchical routing improves scalability by grouping routers into regions, reducing routing table size. Instead of storing entries for every router, routers store information about their region and higher-level summaries. For example, 720 routers in 24 regions of 30 reduces table entries from 720 to ~53 (30 local + 23 remote).

Card 6/10

Q: Compare 'distinct packet' broadcasting with multi-destination routing regarding bandwidth efficiency.

A: Distinct packet broadcasting creates a separate packet for each destination, consuming significant bandwidth. Multi-destination routing includes a list of destinations within each packet, allowing routers to create copies only when necessary, conserving bandwidth, especially when multiple packets share routes.

Card 7/10

Q: How does Reverse Path Forwarding (RPF) prevent broadcast storms?

A: RPF checks if a broadcast packet arrived on the shortest path to the source. If so, it's forwarded; otherwise, it's discarded as a likely duplicate. This prevents loops and redundant transmissions, mitigating broadcast storms.

Card 8/10

Q: What are the advantages and a key issue with using spanning trees for broadcasting?

A: Spanning trees ensure a broadcast packet reaches every router exactly once, minimizing packet count and maximizing bandwidth. However, each router needs knowledge of the spanning tree topology, requiring distribution and maintenance of this information.

Card 9/10

Q: Compare and contrast dense mode and sparse mode multicast routing.

A: Dense mode proactively forwards multicast traffic to all interfaces until pruned. Sparse mode only forwards traffic upon downstream request. Dense mode is simpler but less efficient in sparsely populated groups, while sparse mode is more efficient but requires more complex signaling.

Card 10/10

Q: How do core-based trees address the disadvantages of pruning in multicast routing?

A: Pruning requires routers to store *m* x *n* trees (for *n* groups with *m* members each). Core-based trees designate a single core router per group, reducing storage to one tree per group per router. Members join via the core, simplifying forwarding and drastically reducing resource requirements.